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.fround

Function to round and format a number

Description

Function to round and format a number

Usage

.fround(x, digits)

Arguments

x the data to round and format
digits the number of digits to used

Value

a character vector

.quantilePercentiles

Internal Function to Calculate Quantiles

Description

Function calculates smoothing spline quantiles or linear quantiles as a fall back. Not intended for general use. Expected predicted and residual data. Exported to support related packages.

Usage

.quantilePercentiles(data, LL = 0.1, UL = 0.9, na.rm = TRUE)
Arguments

- **data**: A dataset of predicted and residual values. Assumed from some sort of (probably parametric) model.
- **LL**: The lower limit for prediction. Defaults to .1 to give the 10th percentile.
- **UL**: The upper limit for prediction. Defaults to .9 to give the 90th percentile.
- **na.rm**: A logical whether to remove missing values. Defaults to TRUE

Value

A data.table with the scores and predicted LL and UL, possibly missing if quantile regression models do not converge.

aces_daily Multilevel Daily Data Example

Description

A data frame drawn from a daily diary study, conducted at Monash University in 2017 where young adults old completed measures up to three times per day (morning, afternoon, and evening) for about 12 days. Thus each participant contributed about 36 observations to the dataset. To protect participant confidentiality and anonymity, the data used here were simulated from the original data, but in such a way as to preserve the relations among variables and most features of the raw data.

Usage

aces_daily

Format

A data frame containing 19 variables.

- **UserID**: A unique identifier for each individual
- **SurveyDay**: The date each observation occurred on
- **SurveyInteger**: The survey coded as an integer (1 = morning, 2 = afternoon, 3 = evening)
- **SurveyStartTime**: Survey start time, centered at time since 11am
- **Female**: A 0 or 1 variable, where 1 = female and 0 = male
- **Age**: Participant age in years, top coded at 25
- **BornAUS**: A 0 or 1 variable where 1 = born in Australia and 0 = born outside of Australia
- **SES_1**: Participants subjective SES, bottom coded at 4 and top coded at 8
- **EDU**: Participants level of education (1 = university graduate or higher, 0 = less than university graduate)
- **SOLs**: Self-reported sleep onset latency in minutes, morning survey only
**WASONs** Self-reported number of wakenings after sleep onset, top coded at 4, morning survey only

**STRESS** Overall stress ratings on a 0–10 scale, repeated 3x daily

**SUPPORT** Overall social support ratings on a 0–10 scale, repeated 3x daily

**PosAff** Positive affect ratings on a 1–5 scale, repeated 3x daily

**NegAff** Negative affect ratings on a 1–5 scale, repeated 3x daily

**COPEPrb** Problem focused coping on a 1–4 scale, repeated 1x daily at the evening survey

**COPEPrc** Emotional processing coping on a 1–4 scale, repeated 1x daily at the evening survey

**COPEExp** Emotional expression coping on a 1–4 scale, repeated 1x daily at the evening survey

**COPEDis** Mental disengagement coping on a 1–4 scale, repeated 1x daily at the evening survey

---

**APAStyler**

*A generic function for pretty printing in (semi) APA Style*

**Description**

A generic function for pretty printing in (semi) APA Style

**Usage**

`APAStyler(object, ...)`

**Arguments**

- `object`: An object with a class matching one of the methods
- `...`: Additional arguments passed on to methods.

---

**APAStyler.list**

*APAStyler method for lists*

**Description**

This assumes that all the objects in a list have the same class and that an `APAStyler` method exists for that class.

**Usage**

```r
## S3 method for class 'list'
APAStyler(object, ...)
```

**Arguments**

- `object`: A list in this case, where each element is another known class.
- `...`: Additional arguments.
Value

Styled results.

Examples

```r
## Not run:
m1 <- lm(mpg ~ qsec * hp, data = mtcars)
m2 <- lm(mpg ~ qsec + hp, data = mtcars)
m3 <- lm(mpg ~ am + vs, data = mtcars)
mt1 <- modelTest(m1)
mt2 <- modelTest(m2)
mt3 <- modelTest(m3)

## styling regression models
APAStyler(list(m1, m2))

## modelTest objects get merged
APAStyler(list(mt1, mt2))

## the models can be named by passing a named list
## including "special" characters using backticks, like spaces
APAStyler(list(Full = mt1, Reduced = mt2))
APAStyler(list(Full = mt1, Reduced = mt2, 'Alternate Model' = mt3))

## you can customize the way output is presented
APAStyler(list(mt1, mt2), format = list(
  FixedEffects = "%s, %s\n(%s, %s)",
  EffectSizes = "Cohen\'s f2 = %s (%s)"))

## clean up
rm(m1, m2, m3, mt1, mt2, mt3)

## End(Not run)
```

---

### APAStyler.lm

**APAStyler method for linear models**

**Description**

APAStyler method for linear models

**Usage**

```r
## S3 method for class 'lm'
APAStyler(object, digits = 2, pdigits, file, ...)
```
### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object</td>
<td>A lm object</td>
</tr>
<tr>
<td>digits</td>
<td>The number of digits to round results to. Defaults to 2.</td>
</tr>
<tr>
<td>pdigits</td>
<td>The number of digits to use for p values. Defaults to digits + 1 if missing.</td>
</tr>
<tr>
<td>file</td>
<td>An optional argument indicating whether the output should be written to a file.</td>
</tr>
<tr>
<td>...</td>
<td>Additional arguments passed on to <code>write.table</code>.</td>
</tr>
</tbody>
</table>

### Description

A generic function for pretty printing in (semi) APA Style.

### Usage

```r
## S3 method for class 'mira'
APASTyler(object, lmobject, digits = 2, pdigits, file, ...)
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object</td>
<td>mira object</td>
</tr>
<tr>
<td>lmobject</td>
<td>an lm object the degrees of freedom of which can be used for conservative F tests</td>
</tr>
<tr>
<td>digits</td>
<td>The number of digits to round results to. Defaults to 2.</td>
</tr>
<tr>
<td>pdigits</td>
<td>The number of digits to use for p values. Defaults to digits + 1 if missing.</td>
</tr>
<tr>
<td>file</td>
<td>An optional argument indicating whether the output should be written to a file.</td>
</tr>
<tr>
<td>...</td>
<td>Additional arguments passed on to <code>write.table</code>.</td>
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### Description

APASTyler method for model tests from a linear model.
Usage

```r
## S3 method for class 'modelTest.lm'
APASTyler(
  object,
  format = list(FixedEffects = c("%s%s [%s, %s]"), EffectSizes = c("f2 = %s, %s")),
  digits = 2,
  pcontrol = list(digits = 3, stars = TRUE, includeP = FALSE, includeSign = FALSE,
                   dropLeadingZero = TRUE),
  ...
)
```

Arguments

- `object`: A `modelTest.lm` class object, results from running `modelTest()` function on a `lm` object.
- `format`: A list giving the formatting style to be used for the fixed effects and effect sizes.
- `digits`: A numeric value indicating the number of digits to print. This is still in early implementation stages and currently does not change all parts of the output (which default to 2 decimals per APA style).
- `pcontrol`: A list controlling how p values are formatted.
- `...`: Additional arguments.

Value

- Styled results.

Examples

```r
m1 <- lm(mpg ~ qsec * hp, data = mtcars)
APASTyler(modelTest(m1))

APASTyler(modelTest(m1),
  format = list(
    FixedEffects = "%s %s\n(%s, %s)",
    EffectSizes = "Cohen's f2 = %s (%s)"),
    pcontrol = list(digits = 4,
                   stars = FALSE, includeP = TRUE,
                   includeSign = TRUE,
                   dropLeadingZero = TRUE))

## clean up
rm(m1)
```
Description

APASstyler method for model tests from a vglm multinomial model

Usage

## S3 method for class 'modelTest.vglm'
APASstyler(
  object,
  format = list(FixedEffects = c("%s%s [%s, %s]"), EffectSizes =
    c("Chi-square (df=%s) = %s, %s")),
  digits = 2,
  pcontrol = list(digits = 3, stars = TRUE, includeP = FALSE, includeSign = FALSE,
    dropLeadingZero = TRUE),
  OR = TRUE,
  ...
)

Arguments

object          A modelTest.vglm class object, results from running modelTest() function on
                a class vglm object with a multinomial family
format          A list giving the formatting style to be used for the fixed effects and effect sizes.
digits          A numeric value indicating the number of digits to print. This is still in early
                implementation stages and currently does not change all parts of the output (which
                default to 2 decimals per APA style).
pcontrol        A list controlling how p values are formatted.
OR               a logical value whether to report odds ratios and 95 percent confidence
                intervals, if TRUE, or regression coefficients on the logit scale with standard errors, if
                FALSE.
...              Additional arguments.

Value

Styled results.

Examples

mtcars$cyl <- factor(mtcars$cyl)
m <- VGAM::vglm(cyl ~ qsec,
  family = VGAM::multinomial(), data = mtcars)
mt <- modelTest(m)
APAStyler(mt)

APAStyler(mt, OR = FALSE)

## clean up
rm(m, mt, mtcars)

## Not run:
mtcars$cyl <- factor(mtcars$cyl)
mtcars$am <- factor(mtcars$am)
m <- VGAM::vglm(cyl ~ qsec,
   family = VGAM::multinomial(), data = mtcars)
APAStyler(modelTest(m))

m <- VGAM::vglm(cyl ~ scale(qsec),
   family = VGAM::multinomial(), data = mtcars)
APAStyler(modelTest(m))

m2 <- VGAM::vglm(cyl ~ factor(vs) * scale(qsec),
   family = VGAM::multinomial(), data = mtcars)
APAStyler(modelTest(m2))

m <- VGAM::vglm(Species ~ Sepal.Length,
   family = VGAM::multinomial(), data = iris)
APAStyler(modelTest(m))

set.seed(1234)
sampdata <- data.frame(Outcome = factor(sample(letters[1:3], 20 * 9, TRUE)),
   C1 = rnorm(20 * 9),
   D3 = sample(paste0("L", 1:3), 20 * 9, TRUE))

m <- VGAM::vglm(Outcome ~ factor(D3),
   family = VGAM::multinomial(), data = sampdata)
APAStyler(modelTest(m))

m <- VGAM::vglm(Outcome ~ factor(D3) + C1,
   family = VGAM::multinomial(), data = sampdata)
APAStyler(modelTest(m))

## End(Not run)

---

**APAStyler.SEMSummary**

A generic function for pretty printing in (semi) APA Style

**Description**

A generic function for pretty printing in (semi) APA Style
Usage

```r
## S3 method for class 'SEMSummary'
APAStyler(
  object,
  digits = 2,
  type = c("cov", "cor", "both"),
  stars = FALSE,
  file = ifelse(.Platform$OS.type == "windows", "clipboard", FALSE),
  sep = "\\t",
  ...
)
```

Arguments

- **object**: SEMSummary object
- **digits**: The number of digits to round results to. Defaults to 2.
- **type**: A character vector giving what to print. Defaults to ‘cov’, the covariances. Other options are ‘cor’ and ‘both’.
- **stars**: A logical value whether to include significance values as stars (** * p < .05). Others are *** p < .001, ** p < .01, * p < .05).
- **file**: An optional argument indicating whether the output should be written to a file.
- **sep**: Character what the separator for the table should be. Defaults to tabs.
- **...** Additional arguments passed on to `write.table`.

Examples

```r
m <- SEMSummary(~., data = mtcars)
APAStyler(m, type = "cor", stars = FALSE, file = FALSE)
APAStyler(m, type = "cov", stars = FALSE, file = FALSE)
APAStyler(m, type = "both", stars = FALSE, file = FALSE)
APAStyler(m, type = "cor", stars = TRUE, file = FALSE)
APAStyler(m, type = "cov", stars = TRUE, file = FALSE)
APAStyler(m, type = "both", stars = TRUE, file = FALSE)
```

---

**as.na**

Coerces vectors to missing

Description

Given a vector, convert it to missing (NA) values, where the class of the missing matches the input class. Currently supports character, logical, integer, factor, numeric, times (from `chron`), Date, POSIXct, POSIXlt, and zoo (from `zoo`).

Usage

```r
as.na(x)
```
Arguments

- **x**: A vector to convert to missing (NA)

Value

A vector the same length as the input with missing values of the same class

Examples

```r
str(as.na(1L:5L))
str(as.na(rnorm(5)))
str(as.na(c(TRUE, FALSE)))
str(as.na(as.Date("2017-01-01")))
```

---

**cd**

*Change directory*

Description

The function takes a path and changes the current working directory to the path. If the directory specified in the path does not currently exist, it will be created.

Usage

```r
cd(base, pre, num)
```

Arguments

- **base**: a character string with the base path to the directory. This is required.
- **pre**: an optional character string with the prefix to add to the base path. Non character strings will be coerced to character class.
- **num**: an optional character string, prefixed by `pre`. Non character strings will be coerced to character class.

Details

The function has been designed to be platform independent, although it has had limited testing. Path creation is done using `file.path`, the existence of the directory is checked using `file.exists` and the directory created with `dir.create`. Only the first argument is required. The other optional arguments are handy when one wants to create many similar directories with a common base.

Value

NULL, changes the current working directory
compareIVs

Examples

```r
## Not run:
# an example just using the base
cd("~/testdir")

# an example using the optional arguments
base <- "~/testdir"
pre <- "test_"

cd(base, pre, 1)
cd(base, pre, 2)

## End(Not run)
```

---

**compareIVs**

*Compares the effects of various independent variables on dependent variables*

---

**Description**

Utility to estimate the unadjusted, covariate adjusted, and multivariate adjusted unique contributions of one or more IVs on one or more DVs

**Usage**

```r
compareIVs(
  dv, 
  type, 
  iv, 
  covariates = character(), 
  data, 
  multivariate = FALSE, 
  ...
)
```

**Arguments**

- **dv**
  - A character string or vector of the dependent variable(s)
- **type**
  - A character string or vector indicating the type of dependent variable(s)
- **iv**
  - A character string or vector giving the IV(s)
- **covariates**
  - A character string or vector giving the covariate(s)
- **data**
  - The data to be used for analysis
- **multivariate**
  - A logical value whether to have models with all IVs simultaneously.
- **...**
  - Additional arguments passed on to the internal function, `.runIt`. 
Value

A list with all the model results.

Examples

test1 <- compareIVs(
   dv = c("mpg", "disp"),
   type = c("normal", "normal"),
   iv = c("hp", "qsec"),
   covariates = "am",
   data = mtcars, multivariate = TRUE)
test1$OverallSummary
rm(test1)

cor2cov

Convert a correlation matrix and standard deviations to a covariance matrix

Description

This is a simple function designed to convert a correlation matrix (standardized covariance matrix) back to a covariance matrix. It is the opposite of cov2cor.

Usage

cor2cov(V, sigma)

Arguments

V an n x n correlation matrix. Should be numeric, square, and symmetric.
sigma an n length vector of the standard deviations. The length of the vector must match the number of columns in the correlation matrix.

Value

an n x n covariance matrix

See Also

cov2cor

Examples

# using a built in dataset
cor2cov(cor(longley), sapply(longley, sd))

# should match the above covariance matrix
cov(longley)
all.equal(cov(longley), cor2cov(cor(longley), sapply(longley, sd)))
corOK  

Return a non-missing correlation matrix

Description
Given a square, symmetric matrix (such as a correlation matrix) this function tries to drop the fewest possible number of variables to return a (square, symmetric) matrix with no missing cells.

Usage
```r
corOK(x, maxiter = 100)
```

Arguments
- **x**: a square, symmetric matrix or object coercable to such (such as a data frame).
- **maxiter**: a number indicating the maximum number of iterations, currently as a sanity check. See details.

Details
The assumption that x is square and symmetric comes because it is assumed that the number of missing cells for a given column are identical to that of the corresponding row. corOK finds the column with the most missing values, and drops that (and its corresponding row), and continues on in like manner until the matrix has no missing values. Although this was intended for a correlation matrix, it could be used on other types of matrices. Note that because corOK uses an iterative method, it can be slow when many columns/rows need to be removed. For the intended use (correlation matrices) there probably should not be many missing. As a sanity check and to prevent tediously long computations, the maximum number of iterations can be set.

Value
A list with two elements
- **x**: The complete non missing matrix.
- **keep.indices**: A vector of the columns and rows from the original matrix to be kept (i.e., that are nonmissing).

Examples
```r
cormat <- cor(iris[, -5])
# set missing
cormat[cbind(c(1,2), c(2,1))] <- NA

# print
cormat

# return complete
corOK(cormat)
```
# using maximum iterations
corOK(cormat, maxiter=0)

# clean up
rm(cormat)

---

corplot  
Heatmap of a Correlation Matrix

Description

This function creates a heatmap of a correlation matrix using `ggplot2`.

Usage

```r
corplot(
  x,
  coverage,
  pvalues,
  type = c("cor", "p", "coverage"),
  digits = 2,
  order = c("cluster", "asis"),
  ...
  control.grobs = list()
)
```

Arguments

- `x`: A correlation matrix or some other square symmetric matrix.
- `coverage`: An (optional) matrix with the same dimensions as `x` giving the proportion of data present. Particularly useful when the correlation matrix is a pairwise present.
- `pvalues`: An (optional) matrix with the same dimensions as `x` giving the p values for each correlation. To show, use `plot = "p"`.
- `type`: A character string indicating what to show on top of the heatmap. Can be ‘coverage’, in which case bubble points show coverage; ‘p’, in which case p values are shown, or ‘cor’, in which case correlations are shown. Only has an effect if a coverage (or pvalue) matrix is passed also. Defaults to cor.
- `digits`: The number of digits to round to when printing the correlations on the heatmap. Text is suppressed when a coverage matrix is passed and `points = TRUE`.
- `order`: A character string indicating how to order the resulting plot. Defaults to ‘cluster’ which uses hierarchical clustering to sensibly order the variables. The other option is ‘asis’ in which case the matrix is plotted in the order it is passed.
- `...`: Additional arguments currently only passed to `hclust` and `corOK`.
- `control.grobs`: A list of additional `quote()`d options to customize the `ggplot2` output.
Details

The actual plot is created using ggplot2 and geom_tile. In addition to creating the plot, the variables are ordered based on a hierarchical clustering of the correlation matrix. Specifically, 1 - \( x \) is used as the distance matrix. If coverage is passed, will also add a bubble plot with the area proportional to the proportion of data present for any given cell. Defaults for ggplot2 are set, but it is possible to use a named list of quote()d ggplot calls to override all defaults. This is not expected for typical use. Particularly main, points, and text as these rely on internal variable names; however, labels, the gradient color, and area scaling can be adjusted more safely.

Value

Primarily called for the side effect of creating a plot. However, the ggplot2 plot object is returned, so it can be saved, replotted, edited, etc.

Examples

```r
# example plotting the correlation matrix from the
# mtcars dataset
corplot(cor(mtcars))

dat <- as.matrix(iris[, 1:4])

# randomly set 25% of the data to missing
set.seed(10)
dat[sample(length(dat), length(dat) * .25)] <- NA

# create a summary of the data (including coverage matrix)
sdat <- SEMSummary(~ ., data = dat)
# using the plot method for SEMSummary (which basically just calls corplot)
plot(sdat)

## getting p values instead of coverage
# plot(sdat, type = "p")

## showing correlations instead of coverage
# plot(sdat, type = "cor")

# use the control.grobs argument to adjust the coverage scaling
# to go from 0 to 1 rather than the range of coverage
corplot(x = sdat$sSigma, coverage = sdat$coverage,
         control.grobs = list(area = quote(scale_size_area(limits = c(0, 1)))))

# also works with plot() on a SEMSummary
plot(x = sdat, control.grobs = list(area = quote(scale_size_area(limits = c(0, 1)))))

rm(dat, sdat)
```
cramerV  
*Calculate Phi or Cramer’s V effect size*

**Description**
Simple function to calculate effect sizes for frequency tables.

**Usage**
cramerV(x)

**Arguments**
x  
A frequency table, such as from xtabs().

**Value**
A numeric value with Phi for 2 x 2 tables or Cramer’s V for tables larger than 2 x 2.

**Examples**
cramerV(xtabs(~ am + vs, data = mtcars))
cramerV(xtabs(~ cyl + vs, data = mtcars))
cramerV(xtabs(~ cyl + am, data = mtcars))

egltable  
*Function makes nice tables*

**Description**
Give a dataset and a list of variables, or just the data in the vars. For best results, convert categorical variables into factors. Provides a table of estimated descriptive statistics optionally by group levels.

**Usage**
egltable(
  vars,
  g,
  data,
  idvar,
  strict = TRUE,
  parametric = TRUE,
  paired = FALSE,
  simChisq = FALSE,
  sims = 1e+06
)
Arguments

vars
Either an index (numeric or character) of variables to access from the data argument, or the data to be described itself.

g
A variable used to group/separate the data prior to calculating descriptive statistics.

data
optional argument of the dataset containing the variables to be described.

idvar
A character string indicating the variable name of the ID variable. Not currently used, but will eventually support egltable supporting repeated measures data.

strict
Logical, whether to strictly follow the type of each variable, or to assume categorical if the number of unique values is less than or equal to 3.

parametric
Logical whether to use parametric tests in the case of multiple groups to test for differences. Only applies to continuous variables. If TRUE, the default, uses one-way ANOVA, and a F test. If FALSE, uses the Kruskal-Wallis test.

paired
Logical whether the data are paired or not. Defaults to FALSE. If TRUE, the grouping variable, g, must have two levels and idvar must be specified. When used a paired t-test is used for parametric, continuous data and a Wilcoxon test for paired non parametric, continuous data and a McNemar chi square test is used for categorical data.

simChisq
Logical whether to estimate p-values for chi-square test for categorical data when there are multiple groups, by simulation. Defaults to FALSE. Useful when there are small cells as will provide a more accurate test in extreme cases, similar to Fisher Exact Test but generalizing to large dimension of tables.

sims
Integer for the number of simulations to be used to estimate p-values for the chi-square tests for categorical variables when there are multiple groups.

Value

A data frame of the table.

Examples

egltable(iris)
egltable(colnames(iris)[1:4], "Species", data = iris)
egltable(iris, parametric = FALSE)
egltable(colnames(iris)[1:4], "Species", iris, parametric = FALSE)
egltable(colnames(iris)[1:4], "Species", iris, parametric = c(TRUE, TRUE, FALSE, FALSE))
egltable(colnames(iris)[1:4], "Species", iris, parametric = c(TRUE, TRUE, FALSE, FALSE), simChisq=TRUE)

diris <- data.table::as.data.table(iris)
egltable("Sepal.Length", g = "Species", data = diris)

tmp <- mtcars
tmp$cyl <- factor(tmp$cyl)
tmp$am <- factor(tmp$am, levels = 0:1)
egltable(c("mpg", "hp"), "vs", tmp)
egltable(c("mpg", "hp"), "am", tmp)
egltable(c("am", "cyl"), "vs", tmp)

tests <- with(sleep,
  wilcox.test(extra[group == 1],
              extra[group == 2], paired = TRUE))
str(tests)

## example with paired data
eegltable(c("extra"), g = "group", data = sleep, idvar = "ID", paired = TRUE)

## what happens when ignoring pairing (p-value off)
# egltable(c("extra"), g = "group", data = sleep, idvar = "ID")

## paired categorical data example
## using data on chick weights to create categorical data
tmp <- subset(ChickWeight, Time %in% c(0, 20))
tmp$WeightTertile <- cut(tmp$weight,
                          breaks = quantile(tmp$weight, c(0, 1/3, 2/3, 1), na.rm = TRUE),
                          include.lowest = TRUE)
egltable(c("weight", "WeightTertile"), g = "Time",
              data = tmp,
              idvar = "Chick", paired = TRUE)

rm(tmp)

empirical_pvalue  

\textit{Calculates an empirical p-value based on the data}

\textbf{Description}

This function takes a vector of statistics and calculates the empirical p-value, that is, how many fall on the other side of zero. It calculates a two-tailed p-value.

\textbf{Usage}

\texttt{empirical_pvalue(x, na.rm = TRUE)}

\textbf{Arguments}

\texttt{x}  
\hspace*{1em}a data vector to operate on

\texttt{na.rm}  
\hspace*{1em}Logical whether to remove NA values. Defaults to \texttt{TRUE}

\textbf{Value}

a named vector with the number of values falling at or below zero, above zero, and the empirical p-value.
findSigRegions

Author(s)

Joshua F. Wiley <josh@elkhartgroup.com>

Examples

empirical_pvalue(rnorm(100))

findSigRegions Function to find significant regions from an interaction

Description

This function uses the contrast function from **rms** to find the threshold for significance from interactions.

Usage

```r
findSigRegions(
  object,
  l1,
  l2,
  name.vary,
  lower,
  upper,
  alpha = 0.05,
  starts = 50
)
```

Arguments

- **object**: A fitted **rms** object
- **l1**: the first set of values to fix for the contrast function
- **l2**: the second set of values to fix for the contrast function
- **name.vary**: the name of the model parameter to vary values for to find the threshold. Note that this should not be included in `l1` or `l2` arguments.
- **lower**: The lower bound to search for values for the varying value
- **upper**: The upper bound to search for values for the varying value
- **alpha**: The significance threshold, defaults to .05
- **starts**: Number of starting values to try between the lower and upper bounds.

Value

A data table with notes if no convergence or significance thresholds (if any).
formatHtest

Function to format the results of a hypothesis test as text

Description

Function to format the results of a hypothesis test as text.

Usage

```
formatHtest(
  x,
  type = c("t", "F", "chisq", "kw", "mh", "r_pearson", "r_kendall", "r_spearman"),
  ...
)
```

Arguments

- `x`: A `htest` class object.
- `type`: The type of htest. Currently one of: "t", "F", "chisq", "kw", "mh", "r_pearson", "r_kendall", or "r_spearman" for t-tests, F-tests, chi-square tests, kruskal-wallis tests, Mantel-Haenszel tests, pearson correlations, kendall tau correlation, and spearman rho correlation, respectively.
- `...`: Arguments passed on to p-value formatting.

Value

A character string with results.

Examples

```
formatHtest(t.test(extra ~ group, data = sleep), type = "t")
formatHtest(anova(aov(mpg ~ factor(cyl), data = mtcars)), type = "F")
formatHtest(chisq.test(c(A = 20, B = 15, C = 25)), type = "chisq")
formatHtest(kruskal.test(Ozone ~ Month, data = airquality), type = "kw")
formatHtest(mantelhaen.test(UCBAdmissions), type = "mh")
formatHtest(cor.test(~ mpg + hp, data = mtcars, method = "pearson"), type = "r_pearson")
formatHtest(cor.test(~ mpg + hp, data = mtcars, method = "kendall"), type = "r_kendall")
formatHtest(cor.test(~ mpg + hp, data = mtcars, method = "spearman"), type = "r_spearman")
```
**formatMedIQR**

*Function to format the median and IQR of a variable*

**Description**

Function to format the median and IQR of a variable

**Usage**

```r
formatMedIQR(x, d = 2, na.rm = TRUE)
```

**Arguments**

- `x` the data to have the median and IQR calculated
- `d` How many digits to display. Defaults to 2.
- `na.rm` Logical whether to remove missing values. Defaults to TRUE.

**Value**

A character string with results

**Examples**

```r
formatMedIQR(mtcars$mpg)
```

---

**formatPval**

*Function to simplify formatting p-values for easy viewing / publication*

**Description**

Function to simplify formatting p-values for easy viewing / publication

**Usage**

```r
formatPval(
  x,
  d = 3,
  sd,
  includeP = FALSE,
  includeSign = FALSE,
  dropLeadingZero = TRUE
)
```
Arguments

- **x**: p values to convert
- **d**: number of digits
- **sd**: number of scientific digits. Defaults to d if missing.
- **includeP**: logical value whether to include the character “p” itself. Defaults to FALSE.
- **includeSign**: logical value whether to include the character “=” or “<”. Defaults to FALSE and if includeP = TRUE it must be TRUE.
- **dropLeadingZero**: logical value whether to drop leading zeros for p-values. Defaults to TRUE.

Value

A character string with stars

Examples

```r
formatPval(c(.00052456, .000000124, .01035, .030489, .534946))
formatPval(c(.00052456, .000000124, .01035, .030489, .534946), 3, 3, FALSE, TRUE)
formatPval(c(.00052456, .000000124, .01035, .030489, .534946), 3, 3, TRUE, TRUE)
formatPval(c(.00052456, .000000124, .01035, .030489, .534946), 5)
formatPval(c(1, .15346, .085463, .05673, .04837, .015353462, .0089, .00164, .0006589, .000000053326), 3, 5)
formatPval(c(1, .15346, .085463, .05673, .04837, .015353462, .0089, .00164, .0006589, .000000053326), 3, 5, dropLeadingZero = FALSE)
```

---

**gglikert**

*Creates a plot for likert scale*

Description

Creates a plot for likert scale

Usage

```r
gglikert(
  x,
  y,
  leftLab,
  rightLab,
  colour,
  data,
  xlim,
  title,
  shape = 18,
  size = 7
)
```
Arguments

- **x**: Variable to plot on the x axis (the likert scale responses or averages)
- **y**: The variable containing an index of the different items, should be integers
- **leftLab**: The variable with anchors for the low end of the Likert scale
- **rightLab**: The variable with anchors for the high end of the Likert scale
- **colour**: A character string giving the name of a variable for colouring the data, like a grouping variable. Alternately the colour of points passed to `geom_point`
- **data**: The data to use for plotting
- **xlim**: A vector giving the lower and upper limit for the x axis. This should be the possible range of the Likert scale, not the actual range.
- **title**: A character vector giving the title for the plot
- **shape**: A number indicating the point shape, passed to `geom_point`
- **size**: A number indicating the size of points, passed to `geom_point`

Examples

testdat <- data.table::data.table(
  Var = 1:4,
  Mean = c(1.5, 3, 2.2, 4.6),
  Low = c("Happy", "Peaceful", "Excited", "Content"),
  High = c("Sad", "Angry", "Hopeless", "Anxious"))
gglikert("Mean", "Var", "Low", "High", data = testdat, xlim = c(1, 5),
  title = "Example Plot of Average Affect Ratings")

testdat <- rbind(
  cbind(testdat, Group = "Young"),
  cbind(testdat, Group = "Old"))
testdat$Mean[5:8] <- c(1.7, 2.6, 2.0, 4.4)
gglikert("Mean", "Var", "Low", "High", colour = "Group",
  data = testdat, xlim = c(1, 5),
  title = "Example Plot of Average Affect Ratings")
gglikert("Mean", "Var", "Low", "High", colour = "Group",
  data = testdat, xlim = c(1, 5),
  title = "Example Plot of Average Affect Ratings") +
ggplot2::scale_colour_manual(values = c("Young" = "grey50", "Old" = "black"))

## clean up
rm(testdat)
intSigRegGraph  
*Function to find significant regions from an interaction*

**Description**

This function uses the contrast function from **rms** to find the threshold for significance from interactions.

**Usage**

```r
intSigRegGraph(
  object,
  predList,
  contrastList,
  xvar,
  varyvar,
  varyvar.levels,
  xlab = xvar,
  ylab = "Predicted Values",
  ratio = 1,
  xlim,
  ylim,
  xbreaks,
  xlabels = xbreaks,
  scale.x = c(m = 0, s = 1),
  scale.y = c(m = 0, s = 1),
  starts = 50
)
```

**Arguments**

- **object**: A fitted rms object
- **predList**: TODO
- **contrastList**: TODO
- **xvar**: TODO
- **varyvar**: TODO
- **varyvar.levels**: TODO
- **xlab**: optional
- **ylab**: TODO
- **ratio**: TODO
- **xlim**: TODO
- **ylim**: TODO
- **xbreaks**: TODO
lagk

```r
lagk(x, k = 1, by)
```

**Arguments**

- `x` the variable to lag
- `k` the length to lag it
- `by` a variable to lag by. Must be sorted.

**Value**

a vector of the lagged values

**Examples**

```r
lagk(1:4, 1)
```
meanCircular Calculate a Circular Mean

Description
Function to calculate circular mean

Usage
meanCircular(x, max, na.rm = TRUE)

Arguments
- **x**: Numeric or integer values
- **max**: The theoretical maximum (e.g., if degrees, 360)
- **na.rm**: A logical value indicating whether to remove missing values. Defaults to TRUE.

Value
A numeric value with the circular mean.

Examples
- meanCircular(c(22, 23, 1:2), max = 24)
- meanCircular(c(12, 24), max = 24)
- meanCircular(c(6, 7, 23), max = 24)
- meanCircular(c(6, 7, 21), max = 24)
- meanCircular(c(6, 21), max = 24)
- meanCircular(c(6, 23), max = 24)
- meanCircular(c(.91, .96, .05, .16), max = 1)

modelCompare Compare Two Models

Description
Generic function.
modelCompare

Usage

modelCompare(model1, model2, ...)

as.modelCompare(x)

is.modelCompare(x)

## S3 method for class 'lm'
modelCompare(model1, model2, ...)

Arguments

model1 A fitted model object.
model2 A fitted model object to compare to model1
... Additional arguments passed to specific methods.
x An object (e.g., list or a modelCompare object) to test or attempt coercing to a modelCompare object.

Value

Depends on the method dispatch.

Examples

m1 <- lm(mpg ~ qsec * hp, data = mtcars)
m2 <- lm(mpg ~ am, data = mtcars)
modelCompare(m1, m2)

## cleanup
rm(m1, m2)

## Not run:
m3 <- lm(mpg ~ 1, data = mtcars)
m4 <- lm(mpg ~ 0, data = mtcars)
modelCompare(m3, m4)

## cleanup
rm(m3, m4)

## End(Not run)
modelDiagnostics  Model Diagnostics Functions

Description

A set of functions to calculate model diagnostics on models, including constructors, a generic function, a test of whether an object is of the modelDiagnostics class, and methods.

Usage

modelDiagnostics(object, ...)

as.modelDiagnostics(x)

is.modelDiagnostics(x)

## S3 method for class 'lm'
modelDiagnostics(
  object,
  ev.perc = 0.001,
  robust = FALSE,
  distr = "normal",
  standardized = TRUE,
  ...
)

Arguments

  object  A fitted model object, with methods for model.frame, resid and fitted.
  ...  Additional arguments, not currently used.
  x  An object to test or a list to coerce to a modelDiagnostics object.
  ev.perc  A real number between 0 and 1 indicating the proportion of the theoretical distribution beyond which values are considered extreme values (possible outliers). Defaults to .001.
  robust  Whether to use robust mean and standard deviation estimates for normal distribution
  distr  A character string given the assumed distribution. Passed on to testDistribution. Defaults to “normal”.
  standardized  A logical whether to use standardized residuals. Defaults to TRUE generally where possible but may depend on method.

Value

A logical (is.modelDiagnostics) or a modelDiagnostics object (list) for as.modelDiagnostics and modelDiagnostics.
Examples

testm <- stats::lm(mpg ~ hp * factor(cyl), data = mtcars)

md <- modelDiagnostics(testm)
plot(md$residualDiagnostics$testDistribution)
md$extremeValues

plot(md)

md <- modelDiagnostics(testm, ev.perc = .1)
md$extremeValues
plot(md, ncol = 2)

testdat <- data.frame(
  y = c(1, 2, 2, 3, 3, NA, 9000000, 2, 2, 1),
  x = c(1, 2, 3, 4, 5, 6, 5, 4, 3, 2))

modelDiagnostics(
  lm(y ~ x, data = testdat, na.action = "na.omit"),
  ev.perc = .1)$extremeValues

modelDiagnostics(
  lm(y ~ x, data = testdat, na.action = "na.exclude"),
  ev.perc = .1)$extremeValues

## clean up
rm(testm, md, testdat)

modelPerformance

Return Indices of Model Performance

Description

Generic function. Generally returns things like fit indices, absolute error metrics, tests of overall model significance.

Usage

modelPerformance(object, ...)
as.modelPerformance(x)
is.modelPerformance(x)

## S3 method for class 'lm'
modelPerformance(object, ...)
Arguments

object A fitted model object. The class of the model determines which specific method is called.

... Additional arguments passed to specific methods.

x A object (e.g., list or a modelPerformance object) to test or attempt coercing to a modelPerformance object.

Details

For lm class objects, return number of observations, AIC, BIC, log likelihood, R2, overall model F test, and p-value.

Value

A data.table with results.
A list with a data.table with the following elements:

Model A character string indicating the model type, here lm
N_Obs The number of observations
AIC Akaike Information Criterion
BIC Bayesian Information Criterion
LL log likelihood
LLDF log likelihood degrees of freedom
Sigma Residual variability
R2 in sample variance explained
F2 Cohen’s F2 effect size R2 / (1 - R2)
AdjR2 adjusted variance explained
F F value for overall model significance test
FNumDF numerator degrees of freedom for F test
FDenDF denominator degrees of freedom for F test
P p-value for overall model F test

Examples

modelPerformance(lm(mpg ~ qsec * hp, data = mtcars))

modelPerformance(lm(mpg ~ hp, data = mtcars))

## Not run:
modelPerformance(lm(mpg ~ 0 + hp, data = mtcars))
modelPerformance(lm(mpg ~ 1, data = mtcars))
modelPerformance(lm(mpg ~ 0, data = mtcars))

## End(Not run)
modelTest

Detailed Tests on Models

Description
TODO: make me!

Usage
modelTest(object, ...)
is.modelTest(x)
as.modelTest(x)

## S3 method for class 'vglm'
modelTest(object, ...)

## S3 method for class 'lm'
modelTest(object, ...)

Arguments

object A fitted model object.
...
Additional arguments passed to specific methods.
x A object (e.g., list or a modelTest object) to test or attempt coercing to a modelTest object.

Value
Depends on the method dispatch.
A list with two elements. Results contains a data table of the actual estimates. Table contains a nicely formatted character matrix.
A list with two elements. Results contains a data table of the actual estimates. Table contains a nicely formatted character matrix.

Examples

mtcars$cyl <- factor(mtcars$cyl)
m <- VGAM::vglm(cyl ~ qsec,
    family = VGAM::multinomial(), data = mtcars)
modelTest(m)

## clean up
rm(m, mtcars)

## Not run:
moments

Estimate the first and second moments

Description

This function relies on the lavaan package to use the Expectation Maximization (EM) algorithm to estimate the first and second moments (means and [co]variances) when there is missing data.
moments

Usage

moments(data, ...)

Arguments

data A data frame or an object coercable to a data frame. The means and covariances of all variables are estimated.
... Additional arguments passed on to the estimate.moments.EM function in lavaan. Note this is not an exported function.

Value

A list containing the estimates from the EM algorithm.

mu A named vector of the means.
sigma The covariance matrix.

Author(s)

Suggested by Yves Rosseel author of the lavaan package on which this depends

See Also

SEMSummary

Examples

# sample data
Xmiss <- as.matrix(iris[, -5])
# make 25% missing completely at random
set.seed(10)
Xmiss[sample(length(Xmiss), length(Xmiss) * .25)] <- NA
Xmiss <- as.data.frame(Xmiss)

# true means and covariance
colMeans(iris[, -5])
# covariance with n - 1 divisor
cov(iris[, -5])

# means and covariance matrix using list wise deletion
colMeans(na.omit(Xmiss))
cov(na.omit(Xmiss))

# means and covariance matrix using EM
moments(Xmiss)
# clean up
rm(Xmiss)
Missing and Zero Character Omit

Description
Given a vector, exclude any missing values, not a number values, and if a character class, any zero length strings.

Usage
naz.omit(x)

Arguments
x
A vector to exclude missing or zero length strings from

Value
a vector with missing or zero length strings omitted

Examples

## stats na.omit
stats::na.omit(c(1, NA, NaN))
stats::na.omit(c("test", ",", NA_character_))

naz.omit(c(1, NA, NaN))
naz.omit(c("test", ",", NA_character_))

Calculates summaries for a parameter

Description
This function takes a vector of statistics and calculates several summaries: mean, median, 95 the empirical p-value, that is, how many fall on the other side of zero.

Usage
param_summary(x, trans = function(x) x, ..., na.rm = TRUE)

Arguments
x
da data vector to operate on
trans
A function to transform the data. Used for summaries, but not p-values. Defaults to the identity function.
... Additional arguments passed to formatPval to control p-value printing.
na.rm Logical whether to remove NA values. Defaults to TRUE
Value

A data frame of summary statistics

Examples

param_summary(rnorm(100))

param_summary_format(d, digits = getOption("digits"), pretty = FALSE)

Arguments

d A data frame of the parameter summary statistics
digits Number of digits to round to for printing
pretty Logical value whether prettified values should be returned. Defaults to FALSE.

Value

A formatted data.table of summary statistics or a formatted vector (if pretty = TRUE).

Examples

set.seed(1234)
xsum <- do.call(rbind, apply(matrix(rnorm(100*10), ncol = 10), 2, param_summary))
rownames(xsum) <- letters[1:10]
param_summary_format(xsum)
param_summary_format(xsum, pretty = TRUE)
rm(xsum)
Description

This function creates a number of diagnostic plots from lm models.

Usage

## S3 method for class 'modelDiagnostics.lm'
plot(x, y, plot = TRUE, ask = TRUE, ncol, ...)

Arguments

x A modelDiagnostics class object from lm.
y Included to match the generic. Not used.
plot A logical value whether or not to plot the results or simply return the graphical objects.
ask A logical whether to ask before changing plots. Only applies to interactive environments.
ncol The number of columns to use for plots. Missing by default which means individual plots are created. If specified, plots are put together in a grid.
... Included to match the generic. Not used.

Value

a list including plots of the residuals, residuals versus fitted values

Examples

testm <- stats::lm(mpg ~ hp * factor(cyl), data = mtcars)
md <- modelDiagnostics(testm, ev.perc = .1)

plot(md)
plot(md, ncol = 2)

## clean up
rm(testm, md)
Description

This function creates a number of diagnostic plots from residuals. It is a default method.

Usage

## S3 method for class 'residualDiagnostics'
plot(x, y, plot = TRUE, ask = TRUE, ncol, ...)

Arguments

x   A residualDiagnostics class object.
y   Included to match the generic. Not used.
plot A logical value whether or not to plot the results or simply return the graphical objects.
ask  A logical whether to ask before changing plots. Only applies to interactive environments.
ncol The number of columns to use for plots. Missing by default which means individual plots are created. If specified, plots are put together in a grid.
... Included to match the generic. Not used.

Value

a list including plots of the residuals, residuals versus fitted values

Examples

testm <- stats::lm(mpg ~ hp * factor(cyl), data = mtcars)
md <- residualDiagnostics(testm, ev.perc = .1)
plot(md)
plot(md, ncol = 2)

## clean up
rm(testm, md)
plot.SEMSummary

Plots SEMSummary object

Description
Plots SEMSummary object

Usage
## S3 method for class 'SEMSummary'
plot(x, y, ...)

Arguments
x
An object of class SEMSummary.
y
Ignored
...
Additional arguments passed on to the real workhorse, corplot.

See Also
corplot, SEMSummary

Examples
# default plot
plot(SEMSummary(~ ., data = mtcars))

# same as default
plot(SEMSummary(~ ., data = mtcars), type = "coverage")

# shows p values
plot(SEMSummary(~ ., data = mtcars), type = "p")

# shows correlations
plot(SEMSummary(~ ., data = mtcars), type = "cor")

plot.SEMSummary.list
Plots SEMSummary.list object

Description
Plots SEMSummary.list object

Usage
## S3 method for class 'SEMSummary.list'
plot(x, y, which, plot = TRUE, ...)

# default plot
plot(SEMSummary.list(~ ., data = mtcars))

# same as default
plot(SEMSummary.list(~ ., data = mtcars), type = "coverage")

# shows p values
plot(SEMSummary.list(~ ., data = mtcars), type = "p")

# shows correlations
plot(SEMSummary.list(~ ., data = mtcars), type = "cor")
plot.testDistribution  

Arguments

x  An object of class SEMSummary.list.
y  Ignored
which  either a numeric vector based on the positions, or a character vector giving the names of the levels of the list to plot.
plot  A logical, whether to actually plot the results or not. Defaults to TRUE.
...  Additional arguments passed on to the real workhorse, corplot.

See Also

corplot, SEMSummary

Description

Make plots of testDistribution objects, including density and QQ plots.

Usage

## S3 method for class 'testDistribution'
plot(
  x,
  y,
  xlim = NULL,
  varlab = "X",
  plot = TRUE,
  rugthreshold = 500,
  seed = 1234,
  factor = 1,
  ...
)

Arguments

x  A list of class “testDistribution”.
y  Included to match the generic. Not used.
xlim  An optional vector to control the x limits for the theoretical distribution density line, useful when densities become extreme at boundary values to help keep the scale of the graph reasonable. Passed on to stat_function.
varlab  A character vector the label to use for the variable
plot  A logical vector whether to plot the graphs. Defaults to TRUE.
rugthreshold  Integer determining the number of observations beyond which no rug plot is added. Note that even if this threshold is exceeded, a rug plot will still be added for any extreme values (if extreme values are used and present).

seed  a random seed used to make the jitter added for Poisson and Negative Binomial distributions reproducible

factor  A scale factor for the amount of jitter added to the QQ and Deviates plots for Poisson and Negative Binomial distributions. Defaults to 1. This results in 1 * smallest distance between points / 5 being used.

Value
An invisible list with the ggplot2 objects for graphs, as well as information about the distribution (parameter estimates, name, log likelihood (useful for comparing the fit of different distributions to the data), and a dataset with the sorted data and theoretical quantiles.

See Also
testDistribution

Examples

```R
## Not run:
## example data
set.seed(1234)
d <- data.table::data.table(
  Ynorm = rnorm(200),
  Ybeta = rbeta(200, 1, 4),
  Ychisq = rchisq(200, 8),
  Yf = rf(200, 5, 10),
  Ygamma = rgamma(200, 2, 2),
  Ynbinom = rnbinom(200, mu = 4, size = 9),
  Ypois = rpois(200, 4))

## testing and graphing
plot(testDistribution(d$Ybeta, "beta", starts = list(shape1 = 1, shape2 = 4)))
plot(testDistribution(d$Ychisq, "chisq", starts = list(df = 8)))

## for chi-square distribution, extreme values only on
## the right tail
plot(testDistribution(d$Ychisq, "chisq", starts = list(df = 8),
  extremevalues = "empirical", ev.perc = .1))
plot(testDistribution(d$Ychisq, "chisq", starts = list(df = 8),
  extremevalues = "theoretical", ev.perc = .1))

plot(testDistribution(d$Yf, "f", starts = list(df1 = 5, df2 = 10)))
plot(testDistribution(d$Ygamma, "gamma"))
plot(testDistribution(d$Ynbinom, "poisson"))
plot(testDistribution(d$Ynbinom, "nbinom"))
```
```
plot(testDistribution(d$Ypois, "poisson"))

## compare log likelihood of two different distributions
testDistribution(d$Ygamma, "normal")$Distribution$LL
testDistribution(d$Ygamma, "gamma")$Distribution$LL

plot(testDistribution(d$Ynorm, "normal"))
plot(testDistribution(c(d$Ynorm, 10, 1000), "normal",
   extremevalues = "theoretical"))
plot(testDistribution(c(d$Ynorm, 10, 1000), "normal",
   extremevalues = "theoretical", robust = TRUE))

plot(testDistribution(mtcars, "mvnormal"))

## for multivariate normal mahalanobis distance
## which follows a chi-square distribution, extreme values only on
## the right tail
plot(testDistribution(mtcars, "mvnormal", extremevalues = "empirical",
   ev.perc = .1))
plot(testDistribution(mtcars, "mvnormal", extremevalues = "theoretical",
   ev.perc = .1))

rm(d) ## cleanup

## End(Not run)
```

### R2

**Calculate R2 Values**

**Description**

Generic function to return variance explained (R2) estimates from various models. In some cases these will be true R2 values, in other cases they may be pseudo-R2 values if R2 is not strictly defined for a model.

**Usage**

R2(object, ...)

## S3 method for class 'lm'
R2(object, ...)

**Arguments**

- object: A fitted model object.
- ...: Additional arguments passed to specific methods.
residualDiagnostics

Value

Depends on the method dispatch.

The raw and adjusted r-squared value.

Examples

R2(lm(mpg ~ qsec * hp, data = mtcars))

residualDiagnostics Residual Diagnostics Functions

Description

A set of functions to calculate residual diagnostics on models, including constructors, a generic function, a test of whether an object is of the residualDiagnostics class, and methods.

Usage

residualDiagnostics(object, ...)

as.residualDiagnostics(x)

is.residualDiagnostics(x)

### S3 method for class 'lm'
residualDiagnostics(
  object,
  ev.perc = 0.001,
  robust = FALSE,
  distr = "normal",
  standardized = TRUE,
  ...
)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object</td>
<td>A fitted model object, with methods for model.frame, resid and fitted.</td>
</tr>
<tr>
<td>...</td>
<td>Additional arguments, not currently used.</td>
</tr>
<tr>
<td>x</td>
<td>A object (e.g., list or a modelDiagnostics object) to test or attempt coercing to a residualDiagnostics object.</td>
</tr>
<tr>
<td>ev.perc</td>
<td>A real number between 0 and 1 indicating the proportion of the theoretical distribution beyond which values are considered extreme values (possible outliers). Defaults to .001.</td>
</tr>
<tr>
<td>robust</td>
<td>Whether to use robust mean and standard deviation estimates for normal distribution</td>
</tr>
</tbody>
</table>
roundedfivenum

roundedfivenum  Calculate a rounded five number summary

Description

Numbers are the minimum, 25th percentile, median, 75th percentile, and maximum, of the non missing data. Values returned are either the significant digits or rounded values, whichever ends up resulting in the fewest total digits.

distr  A character string given the assumed distribution. Passed on to testDistribution. Defaults to “normal”.

standardized  A logical whether to use standardized residuals. Defaults to TRUE generally where possible but may depend on method.

Value

A logical (is.residualDiagnostics) or a residualDiagnostics object (list) for as.residualDiagnostics and residualDiagnostics.

Examples

testm <- stats::lm(mpg ~ hp * factor(cyl), data = mtcars)

resm <- residualDiagnostics(testm)
plot(resm$testDistribution)

resm <- residualDiagnostics(testm, standardized = FALSE)
plot(resm$testDistribution)

## clean up
rm(testm, resm)

## Not run:
testdat <- data.frame(
  y = c(1, 2, 2, 3, 3, NA, 9000000, 2, 2, 1),
  x = c(1, 2, 3, 4, 5, 6, 5, 4, 3, 2))

residualDiagnostics(
  lm(y ~ x, data = testdat, na.action = "na.omit"),
  ev.perc = .1)$Residuals

residualDiagnostics(
  lm(y ~ x, data = testdat, na.action = "na.exclude"),
  ev.perc = .1)$Residuals

residualDiagnostics(
  lm(mpg ~ hp, data = mtcars, na.action = "na.omit"),
  ev.perc = .1)$Residuals

## End(Not run)
Usage

roundedfivenum(x, round = 2, sig = 3)

Arguments

x The data to have the summary calculated on
round The number of digits to try rounding
sig The number of significant digits to try

Value

The rounded or significant digit five number summary

Examples

JWileymisc::roundedfivenum(rnorm(1000))
JWileymisc::roundedfivenum(mtcars$hp)

---

SEMSummary

Summary Statistics for a SEM Analysis

Description

This function is designed to calculate the descriptive statistics and summaries that are often reported on raw data when the main analyses use structural equation modelling.

Usage

SEMSummary(
  formula,
  data,
  use = c("fiml", "pairwise.complete.obs", "complete.obs")
)

Arguments

formula A formula of the variables to be used in the analysis. See the ‘details’ section for more information.
data A data frame, matrix, or list containing the variables used in the formula. This is a required argument.
use A character vector of how to handle missing data. Defaults to “fiml”.
**Details**

This function calculates a variety of relevant statistics on the raw data used in a SEM analysis. Because it is meant for SEM style data, for now it expects all variables to be numeric. In the future I may try to expand it to handle factor variables somehow.

Both the formula and data arguments are required. The formula should be the right hand side only. The most common way to use it would be with variable names separated by ‘+’. For convenience, a ‘.’ is expanded to mean “all variables in the data set”. For a large number of variables or when whole datasets are being analyzed, this can be considerably easier to write. Also it facilitates column indexing by simply passing a subset of the data (e.g., `data[,1:10]`) and using the ‘.’ expansion to analyze the first 10 columns. The examples section demonstrate this use.

Also noteworthy is that SEMSummary is not really meant to be used on its own. It is the computational workhorse, but it is meant to be used with a styling or printing method to produce simple output. APAStyler has methods for SEMSummary output.

There are several new ways to handle missing data now including listwise deletion, pairwise deletion, and using the EM algorithm, the default.

**Value**

A list with S3 class “SEMSummary”

- `names` A character vector containing the variable names.
- `n` An integer vector of the length of each variable used (this includes available and missing data).
- `nmissing` An integer vector of the number of missing values in each variable.
- `mu` A vector of the arithmetic means of each variable (on complete data).
- `stdev` A numeric vector of the standard deviations of each variable (on complete data).
- `Sigma` The numeric covariance matrix for all variables.
- `sSigma` The numeric correlation matrix for all variables.
- `coverage` A numeric matrix giving the percentage (technically decimal) of information available for each pairwise covariance/correlation.
- `pvalue` The two-sided p values for the correlation matrix. Pairwise present N used to calculate degrees of freedom.

**See Also**

APAStyler

**Examples**

```r
## Example using the built in iris dataset
s <- SEMSummary(~ Sepal.Length + Sepal.Width + Petal.Length, data = iris)
s # show output ... not very nice

## Prettier output from SEMSummary
APAStyler(s)
```
```r
### Subset the dataset and use the . expansion ###

## summary for all variables in mtcars data set
## with 11 variables, this could be a pain to write out
SEMSummary(~ ., data = mtcars)

## . expansion is also useful when we know column positions
## but not necessarily names
SEMSummary(~ ., data = mtcars[, c(1, 2, 3, 9, 10, 11)])

## clean up
rm(s)

## sample data
Xmiss <- as.matrix(iris[, -5])
# make 10% missing completely at random
set.seed(10)
Xmiss[sample(length(Xmiss), length(Xmiss) * .10)] <- NA
Xmiss <- as.data.frame(Xmiss)

SEMSummary(~ ., data = Xmiss, use = "fiml")

## clean up
rm(Xmiss)
```

---

**SEMSummary.fit**

*Summary Statistics for a SEM Analysis*

**Description**

This is a low level fitting function, for SEMSummary.

**Usage**

```r
SEMSummary.fit(
  formula,
  data,
  use = c("fiml", "pairwise.complete.obs", "complete.obs")
)
```

**Arguments**

- `formula` A formula of the variables to be used in the analysis. See the ‘details’ section for more information.
- `data` A data frame, matrix, or list containing the variables used in the formula. This is a required argument.
- `use` A character vector of how to handle missing data. Defaults to “fiml”.
smd

Value

A list with S3 class “SEMSummary”

names A character vector containing the variable names.
n An integer vector of the length of each variable used (this includes available and missing data).
missing An integer vector of the number of missing values in each variable.
mu A vector of the arithmetic means of each variable (on complete data).
stddev A numeric vector of the standard deviations of each variable (on complete data).
Sigma The numeric covariance matrix for all variables.
sSigma The numeric correlation matrix for all variables.
coverage A numeric matrix giving the percentage (technically decimal) of information available for each pairwise covariance/correlation.
pvalue The two-sided p values for the correlation matrix. Pairwise present N used to calculate degrees of freedom.

See Also

SEMSummary

smd

Calculate Standardized Mean Difference (SMD)

Description

Simple function to calculate effect sizes for mean differences.

Usage

smd(x, g, index = c("all", "1", "2"))

Arguments

x A continuous variable
g A grouping variable, with two levels
index A character string: “all” uses pooled variance, “1” uses the first factor level variance, “2” uses the second factor level variance.

Value

The standardized mean difference.
star

Function to simplify converting p-values to asterisks

Description

Function to simplify converting p-values to asterisks

Usage

star(x, includeMarginal = FALSE)

Arguments

x

p values to convert to stars

includeMarginal

logical value whether to include a symbol for marginally significant >.05 but < .10 p-values. Defaults to FALSE.

Value

A character string with stars

Examples

star(c(.0005, .001, .005, .01, .02, .05, .08, .1, .5, 1))
**testDistribution**

*Test the distribution of a variable against a specific distribution*

**Description**

Function designed to help examine distributions. It also includes an option for assessing multivariate normality using the (squared) Mahalanobis distance. A generic function, some methods, and constructor (`as.testDistribution`) and function to check class (`is.testDistribution`) also are provided.

Note that for the `use` argument, several options are possible. By default it is “complete.obs”, which uses only cases with complete data on all variables. Another option is “pairwise.complete.obs”, which uses all available data for each variable individually to estimate the means and variances, and all pairwise complete observation pairs for each covariance. Because the same cases are not used for all estimates, it is possible to obtain a covariance matrix that is not positive definite (e.g., correlations > +1 or < -1).

Finally, the last option is “fiml”, which uses full information maximum likelihood estimates of the means and covariance matrix. Depending on the number of cases, missing data patterns, and variables, this may be quite slow and computationally demanding.

The `robust` argument determines whether to use robust estimates or not when calculating densities, etc. By default it is `FALSE`, but if `TRUE` and a univariate or multivariate normal distribution is tested, then robust estimates of the means and covariance matrix (a variance if univariate) will be used based on `covMcd` from the `robustbase` package.

**Usage**

```r
testDistribution(x, ...)  
as.testDistribution(x)  
is.testDistribution(x)  
```

```r
## Default S3 method:  
testDistribution(  
  x,  
  distr = c("normal", "beta", "chisq", "f", "gamma", "nbinom", "poisson", "mvnormal"),  
  na.rm = TRUE,  
  starts,  
  extremevalues = c("no", "theoretical", "empirical"),  
  ev.perc = 0.005,  
  use = c("complete.obs", "pairwise.complete.obs", "fiml"),  
  robust = FALSE,  
  ...  
)
```
Arguments

**x**

The data as a single variable or vector to check the distribution unless the distribution is “mvnormal” in which case it should be a data frame or data table.

**...**

Additional arguments. If these include mu and sigma and the distribution is multivariate normal, then it will use the passed values instead of calculating the mean and covariances of the data.

**distr**

A character string indicating the distribution to be tested. Currently one of: “normal”, “beta”, “chisq” (chi-squared), “t”, “gamma”, “nbinom” (negative binomial), “poisson”, or “mvnormal” for multivariate normal where Mahalanobis distances are calculated and compared against a Chi-squared distribution with degrees of freedom equal to the number of variables.

**na.rm**

A logical value whether to omit missing values. Defaults to TRUE.

**starts**

A named list of the starting values. Not required for all distributions. Passed on to fitdistr which fits the maximum likelihood estimates of the distribution parameters.

**extremevalues**

A character vector whether to indicate extreme values. Should be “no” to do nothing, “empirical” to show extreme values based on the observed data percentiles, or “theoretical” to show extreme values based on percentiles of the theoretical distribution.

**ev.perc**

Percentile to use for extreme values. For example if .01, then the lowest 1 percent and highest 1 percent will be labelled extreme values. Defaults to the lowest and highest 0.5 percent.

**use**

A character vector indicating how the moments (means and covariance matrix) should be estimated in the presence of missing data when distr = mvnormal. The default is to use complete observations, but full information maximum likelihood based on functions in lavaan is also available. See details.

**robust**

A logical whether to use robust estimation or not. Currently only applies to normally distributed data (univariate or multivariate). Also, when robust = TRUE, only complete observations are used (i.e., use = "complete.obs"). See details.

Value

A logical whether or not an object is of class testDistribution or an object of the same class. A list with information about the distribution (parameter estimates, name, log likelihood (useful for comparing the fit of different distributions to the data), and a dataset with the sorted data and theoretical quantiles.

See Also

SEMSummary

Examples

### Not run:
## Example Data

```r
set.seed(1234)
d <- data.table::data.table(
  Ynorm = rnorm(200),
  Ybeta = rbeta(200, 1, 4),
  Ychisq = rchisq(200, 8),
  Yf = rf(200, 5, 10),
  Ygamma = rgamma(200, 2, 2),
  Ynbinom = rnbinom(200, mu = 4, size = 9),
  Ypois = rpois(200, 4))
```

## Testing and Graphing

```r
testDistribution(d$Ybeta, "beta", starts = list(shape1 = 1, shape2 = 4))
```

```r
testDistribution(d$Ychisq, "chisq", starts = list(df = 8))
```

## For Chi-Square Distribution, Extreme Values Only on
## the Right Tail

```r
testDistribution(d$Ychisq, "chisq", starts = list(df = 8),
  extremevalues = "empirical", ev.perc = .1)
testDistribution(d$Ychisq, "chisq", starts = list(df = 8),
  extremevalues = "theoretical", ev.perc = .1)
```

```r
testDistribution(d$Yf, "f", starts = list(df1 = 5, df2 = 10))
testDistribution(d$Ygamma, "gamma")
testDistribution(d$Ynbinom, "nbinom")
testDistribution(d$Ypois, "poisson")
```

## Compare Log Likelihood of Two Different Distributions

```r
testDistribution(d$Ygamma, "normal")$Distribution$LL
testDistribution(d$Ygamma, "gamma")$Distribution$LL
```

```r
testDistribution(c(d$Ynorm, 10, 1000), "normal",
  extremevalues = "theoretical")
testDistribution(c(d$Ynorm, 10, 1000), "normal",
  extremevalues = "theoretical", robust = TRUE)
```

```r
testDistribution(mtcars, "mvnormal")
```

## For Multivariate Normal Mahalanobis Distance
## Which Follows a Chi-Square Distribution, Extreme Values Only on
## the Right Tail

```r
testDistribution(mtcars, "mvnormal", extremevalues = "empirical",
  ev.perc = .1)
testDistribution(mtcars, "mvnormal", extremevalues = "theoretical",
  ev.perc = .1)
```

```r
rm(d) # cleanup
```

## End(Not run)
timeshift  

*Shift a time variable to have a new center (zero point)*

**Description**

Given a vector, shift the values to have a new center, but keeping the same minimum and maximum. Designed to work with time values where the minimum indicates the same time as the maximum (e.g., 24:00:00 is the same as 00:00:00).

**Usage**

```r
timeshift(x, center = 0, min = 0, max = 1, inverse = FALSE)
```

**Arguments**

- `x`: the time scores to shift
- `center`: A value (between the minimum and maximum) to center the time scores. Defaults to 0, which has no effect.
- `min`: The theoretical minimum of the time scores. Defaults to 0.
- `max`: the theoretical maximum of the time scores. Defaults to 1.
- `inverse`: A logical value, whether to 'unshift' the time scores. Defaults to FALSE.

**Value**

A vector of shifted time scores, recentered as specified.

**Examples**

```r
## example showing centering at 11am (i.e., 11am becomes new 0)
plot((1:24)/24, timeshift((1:24)/24, 11/24))

## example showing the inverse, note that 24/24 becomes 0
plot((1:24)/24, timeshift(timeshift((1:24)/24, 11/24), 11/24, inverse = TRUE))
```

---

**TukeyHSDgg**

*Tukey HSD Plot*

**Description**

This calculates and displays means, confidence intervals as well as which groups are different based on Tukey’s HSD. Inspired by http://stackoverflow.com/questions/18771516/is-there-a-function-to-add-aov-post-hoc-testing-results-to-ggplot2-boxplot

**Usage**

```r
TukeyHSDgg(x, y, d, ci = 0.95, idvar, ...)
```
VAConverter

Arguments

- **x**: A categorical grouping variable name.
- **y**: A continuous outcome variable name.
- **d**: A dataset
- **ci**: A numeric value indicating the coverage of the confidence interval to use. Defaults to 0.95.
- **idvar**: An optional ID variable for multilevel data
- **...**: Additional arguments passed on.

Value

A ggplot graph object.

Examples

```r
## examples using it with single level data
## differences based on an ANOVA and follow up contrasts
mtcars$cyl <- factor(mtcars$cyl)
TukeyHSDgg("cyl", "mpg", mtcars)
rm(mtcars)

## Not run:
TukeyHSDgg("Species", "Sepal.Length", iris)

## example based on multilevel data
## differences based on model fit with lmer and follow up contrasts
TukeyHSDgg("treatment", "decrease", OrchardSprays, idvar = "colpos")

## End(Not run)
```

VAConverter

Visual Acuity Converter

Description

Converter character (string) input of Snellen fractions, Counting Fingers (CF), and Hand Motion (HM) to logMAR values for use in statistical models. Can handle linear interpolation if passed an appropriate chart or if the measures fit with the default chart.

Usage

```r
VAConverter(
  OS,
  OD,
  chart.values = NULL,
```

Visual Acuity Converter
chart.nletters = NULL,
  datatype = c("snellen", "decimal", "logMAR"),
  zero = 3
)

Arguments

OS          The values to be converted for the left eye (oculus sinister).
OD          The values to be converted for the right eye (oculus dexter)
chart.values The Snellen fractions for the chart used (if interpolation is necessary and it is
different from the default).
chart.nletters The number of letters on each line of the chart that was used. Necessary for
proper interpolation.
datatype     The type of data passed to OS and OD. One of "Snellen" (the default), "decimal",
or "logMAR". Determines what transformations are needed to convert to
logMAR values.
zero         The “zero” logMAR value. This is used as the zero point for visual acuity. For
example, for light perception (LP), no light perception (NLP), etc. It defaults to
3 (which is equivalent to a Snellen value of 20/20000), but may also be NA. See
details.

Details

VAConverter is primarily designed to take raw character data of various forms and convert them
to logMAR values. Acceptable examples include: "20/20", "20/80 + 3", "20/20 - 4", "10/20", "CF
10", "HM 2", "CF 4", "NLP", "LP", ",", "CF", "HM", etc. For Snellen values, both parts should be
present, and there should be a space between components; e.g., between fraction, +/- and number or
between CF and 10. Although I have attempted to make it as flexible and general as possible, there
are still fairly rigid requirements so that it can parse a variety of text formats to numerical values.
Optionally, it can also handle decimal values (i.e., the results of actually dividing a Snellen value
20/20 = 1).

chart.values and chart.nletters must be the same length. These are used to interpolate values
such as "20/20 + 3" which is interpreted as reading all of the letters on the "20/20" line and "3" of
the letters on the next best line (typically "20/15" but this can be chart dependent). The functions
goes 3/n of the distance between the logMAR values for each line. This is why it is important to
know the values for the chart that was actually used.

If datatype = "logMAR", the values passed to OS and OD are directly assigned to the logMAROS and
logMAROD slots of a "VAObject" and an error is returned if that results in the creation of an invalid
object (e.g., they are not numeric or not of equal length).

The zero argument is primarily included to facilitate calculating averages. For example, in some
cases it may be nice to get a sense of an individual’s "overall" or "average" logMAR value. Because
on the logMAR scale, 0 is "20/20", an alternate number needs to be used. 3 was chosen as a rough
default, but it is by no means necessarily the best choice. If you are not interested in computing an
average between the left and right eyes within individuals, it makes sense to simply use NA rather
than a crude "zero" approximation.
Value

An object of class `VAObject`. This includes the left and right eye logMAR values in slots `@logMAROS` and `@logMAROD` as well as additional information. More information can be found in the class documentation.

Examples

```r
## sampdat <- c("HM 12", "20/20 + 3", "20/50", "CF", "HM",  
## "20/70 - 2", "LP", NA, "Prosthetic")
## tmp <- VAConverter(OS = sampdat, OD = rev(sampdat), datatype = "snellen")
```

VAObject-class

An S4 class to hold visual acuity data

Description

A class to hold Visual Acuity data for the oculus sinister (OS; left eye) and oculus dexter (OD; right eye)

Usage

```r
## S4 method for signature 'VAObject,ANY,ANY,ANY'
x[i, j, ..., drop = TRUE]
## S4 method for signature 'VAObject'
print(x, ...)
## S4 method for signature 'VAObject'
show(object)
## S4 method for signature 'VAObject'
summary(object, weightbest = TRUE, w = c(0.75, 0.25))
```

Arguments

- `x` the object to subset
- `i` the rows to subset (optional)
- `j` the columns to subset (optional)
- `...` Additional arguments passed to lower functions
- `drop` should be missing
- `object` A VAObject class object
- `weightbest` Logical whether to upweight the best seeing eye. Defaults to TRUE.
- `w` A numeric vector of the weights, first for the best seeing then the worst seeing eye. Defaults to c(.75, .25).
Methods (by generic)

- `[]`: extract method
- `print`: print method
- `show`: show method
- `summary`: summary method

Slots

- `originalOS`: the original visual acuity data for the left (ocular sinister) eye
- `originalOD`: the original visual acuity data for the right (ocular dexter) eye
- `logMAROS`: logarithm of the minimum angle of resolution data for OS
- `logMAROD`: logarithm of the minimum angle of resolution data for OD
- `chart.values`: the snellen values for each line of the chart used to measure visual acuity. Used for the linear interpolation in the case of partially correct line readings.
- `chart.nletters`: the number of letters on each line of the chart used to measure visual acuity. Used for the linear interpolation in the case of partially correct line readings (+2 is 2/4 of the way to the next line if there are four letters, but only 2/6 if there are six, etc.)
- `zero`: the logMAR value chosen to represent "zero" visual acuity when creating the combined logMAR values for both eyes or taking the arithmetic mean.

---

**VASummaryObject-class**

An S4 class to hold visual acuity summary data

**Description**

A class designed to hold visual acuity summary data

**Usage**

```r
## S4 method for signature 'VASummaryObject'
show(object)
```

```r
## S4 method for signature 'VASummaryObject,missing'
plot(x, y, ...)
```

**Arguments**

- `object`: The object to be shown
- `x`: A VASummaryObject
- `y`: Should be missing
- `...`: Additional, unused arguments
Methods (by generic)

- show: show method
- plot: plot method

Slots

logMAR.combined Numeric values of the combined logarithm of the minimum angle of resolution data for both eyes

snellen.combined the snellen values back transformed from the combined logMAR values

mean.logMAR average of the logarithm of the minimum angle of resolution data

mean.snellen average of the combined Snellen data

Description

Simple function winsorizes data at the specified percentile.

Usage

winsorizor(d, percentile, values, na.rm = TRUE)

Arguments

d A vector, matrix, data frame, or data table to be winsorized

percentile The percentile bounded by [0, 1] to winsorize data at. If a data frame or matrix is provided for the data, this should have the same length as the number of columns, or it will be repeated for all.

values If values are specified, use these instead of calculating by percentiles. Should be a data frame with columns named “low”, and “high”. If a data frame or matrix is provided for the data, there should be as many rows for values to winsorize at as there are columns in the data.

na.rm A logical whether to remove NAs.

Value

winsorized data. Attributes are included to list the exact values (for each variable, if a data frame or matrix) used to winsorize at the lower and upper ends.
Examples

dev.new(width = 10, height = 5)
par(mfrow = c(1, 2))
hist(as.vector(eurodist), main = "Eurodist")
hist(winsorizor(as.vector(eurodist), .05), main = "Eurodist with lower and upper\n5% winsorized")

library(data.table)
dat <- data.table(x = 1:5)
dat[, y := scale(1:5)]
winsorizor(dat$y, .01)

## make a copy of the data table
winsorizor(dat, .01)

winsorizor(mtcars, .01)
winsorizor(matrix(1:9, 3), .01)

rm(dat) # clean up
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